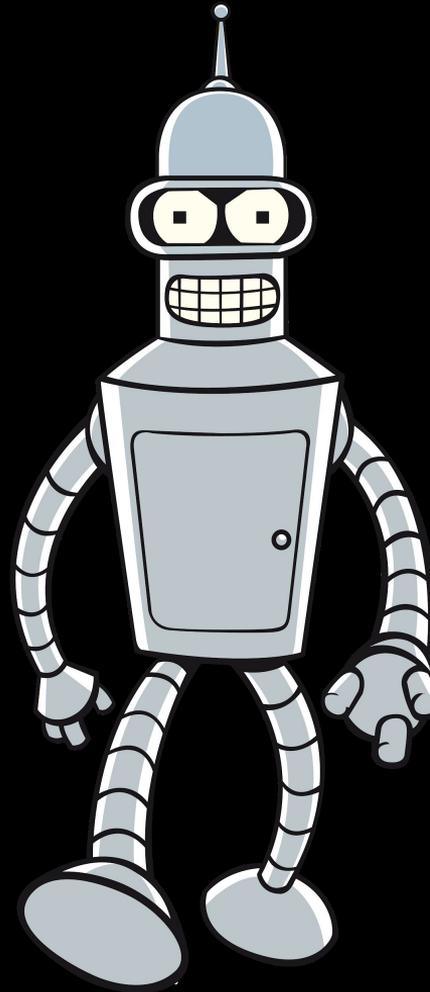




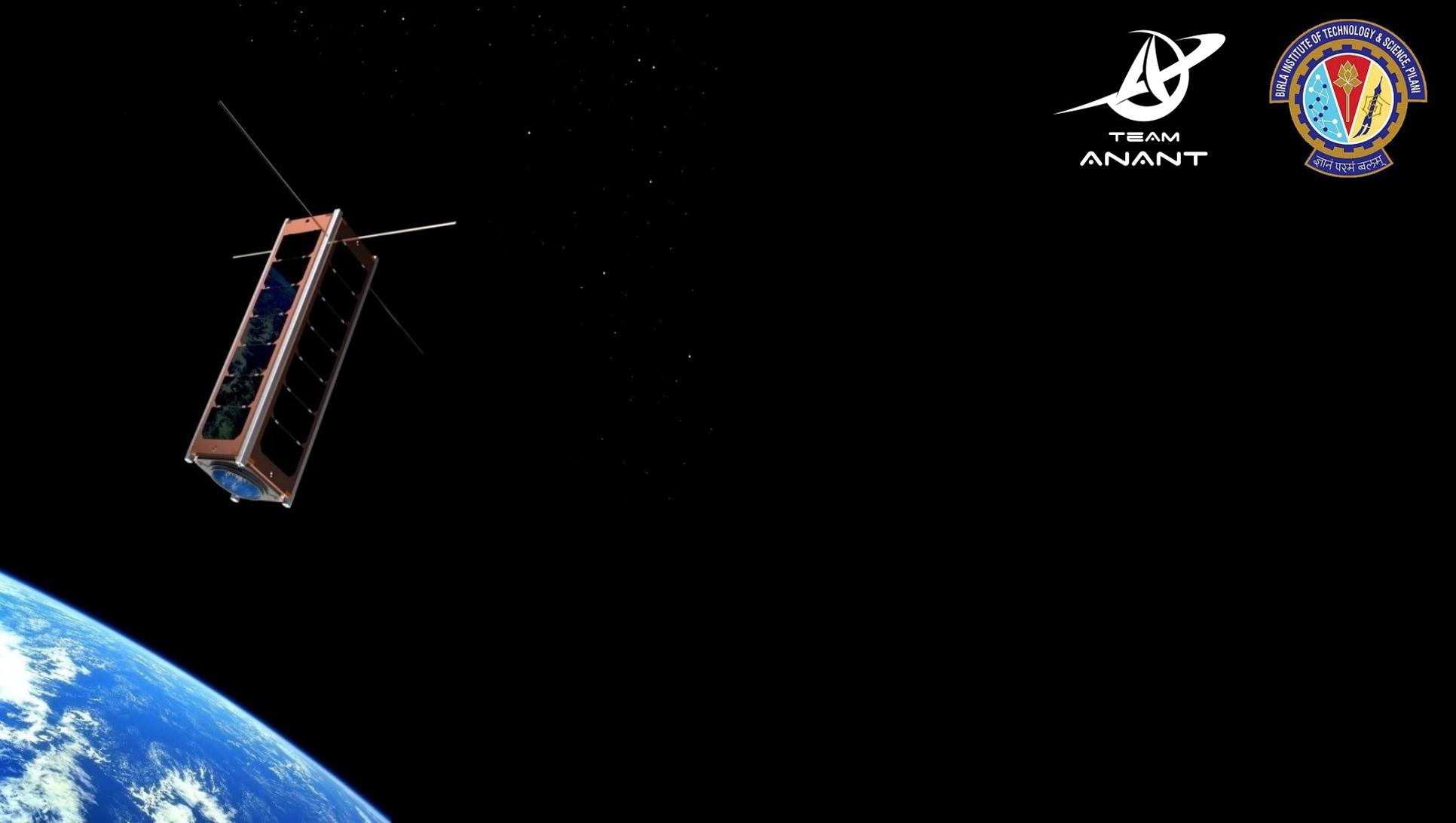
Sending an Aluminium Box to orbit with Open Source

team-anant.org

An AI box to space,
you say?

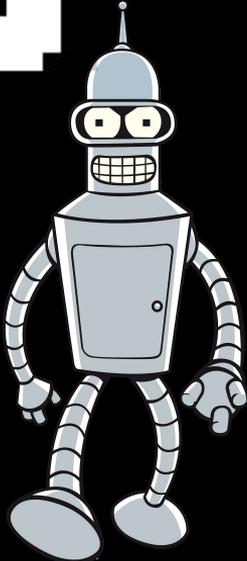


(Futurama
reference)



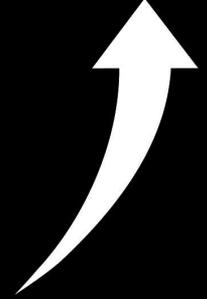


DANG IT

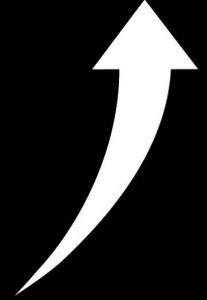




Tanuj who?



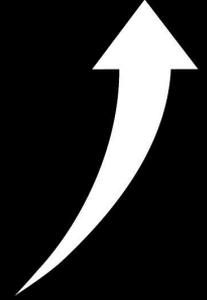
- BITS, Pilani



- BITS, Pilani

- ISRO

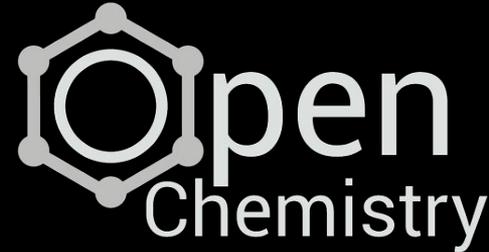




- BITS, Pilani

- ISRO

- Open Source experiences





Why is this talk happening?

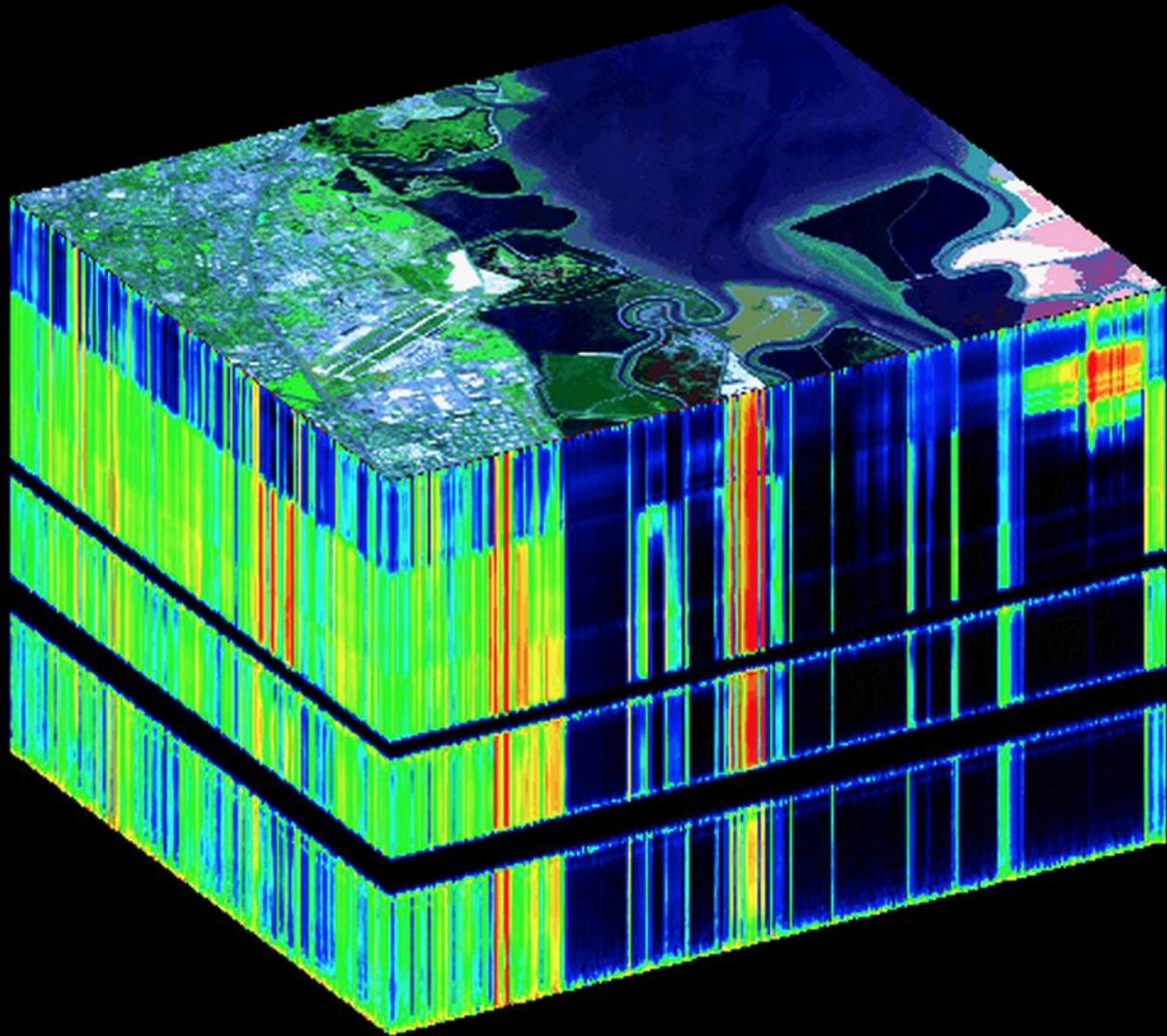


TEAM
ANANT

team-anant.org



First HyS imager in India



Courtesy of
[NASA/JPL-Caltech](#)



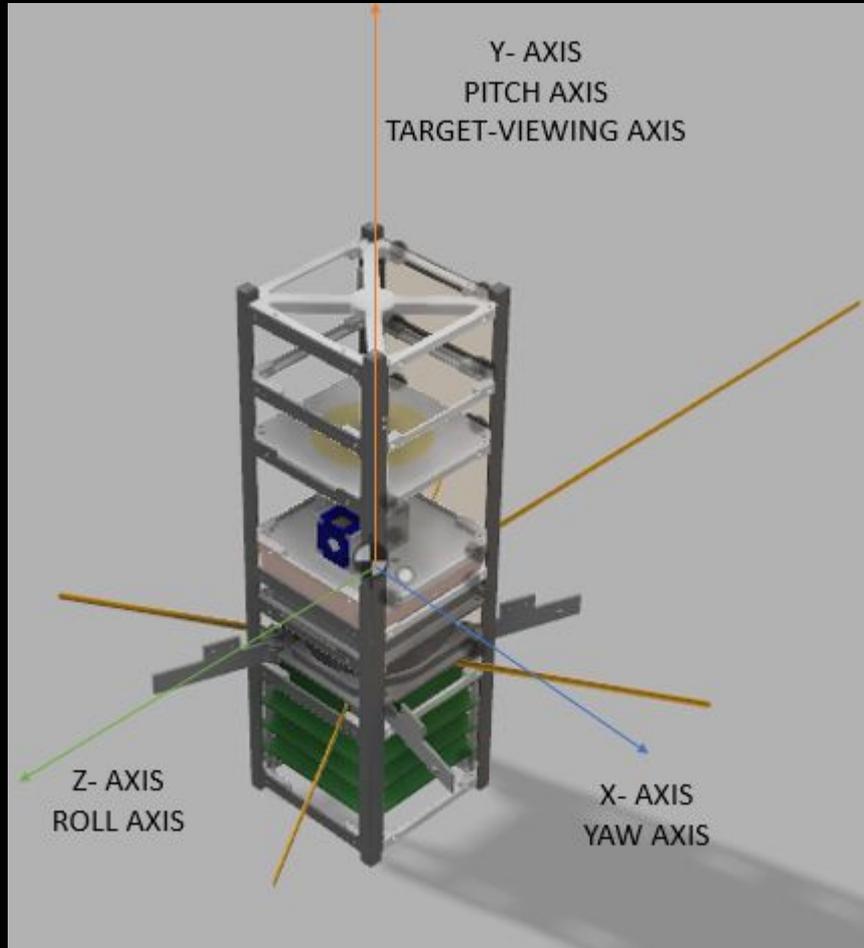
- Payload: First HyS imager in India
- Wavelengths: 400 - 1000 nm
- Resolution: 5 nm



Specs: 3U, 2.84 Kg

Team: 40 Undergrads

Application: CO₂ monitoring





Specs: 3U, 2.84 Kg

Team: 40 Undergrads

Application: CO₂ monitoring



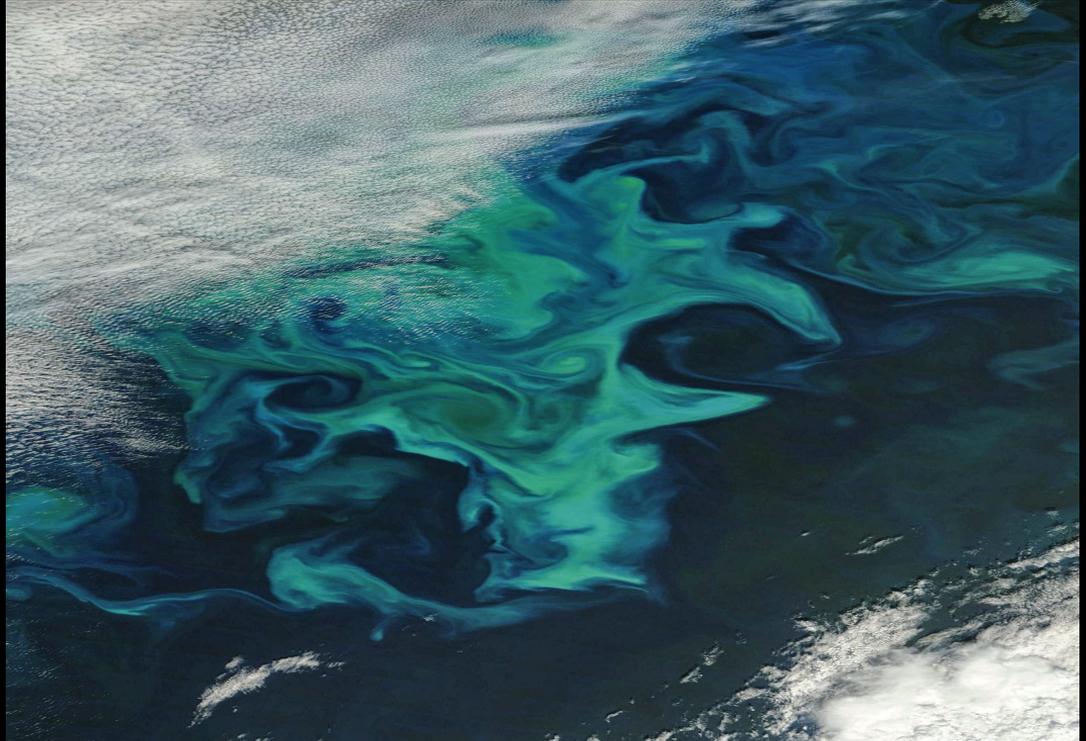




Specs: 3U, 2.84 Kg

Team: 40 Undergrads

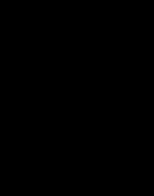
Application: CO₂ monitoring



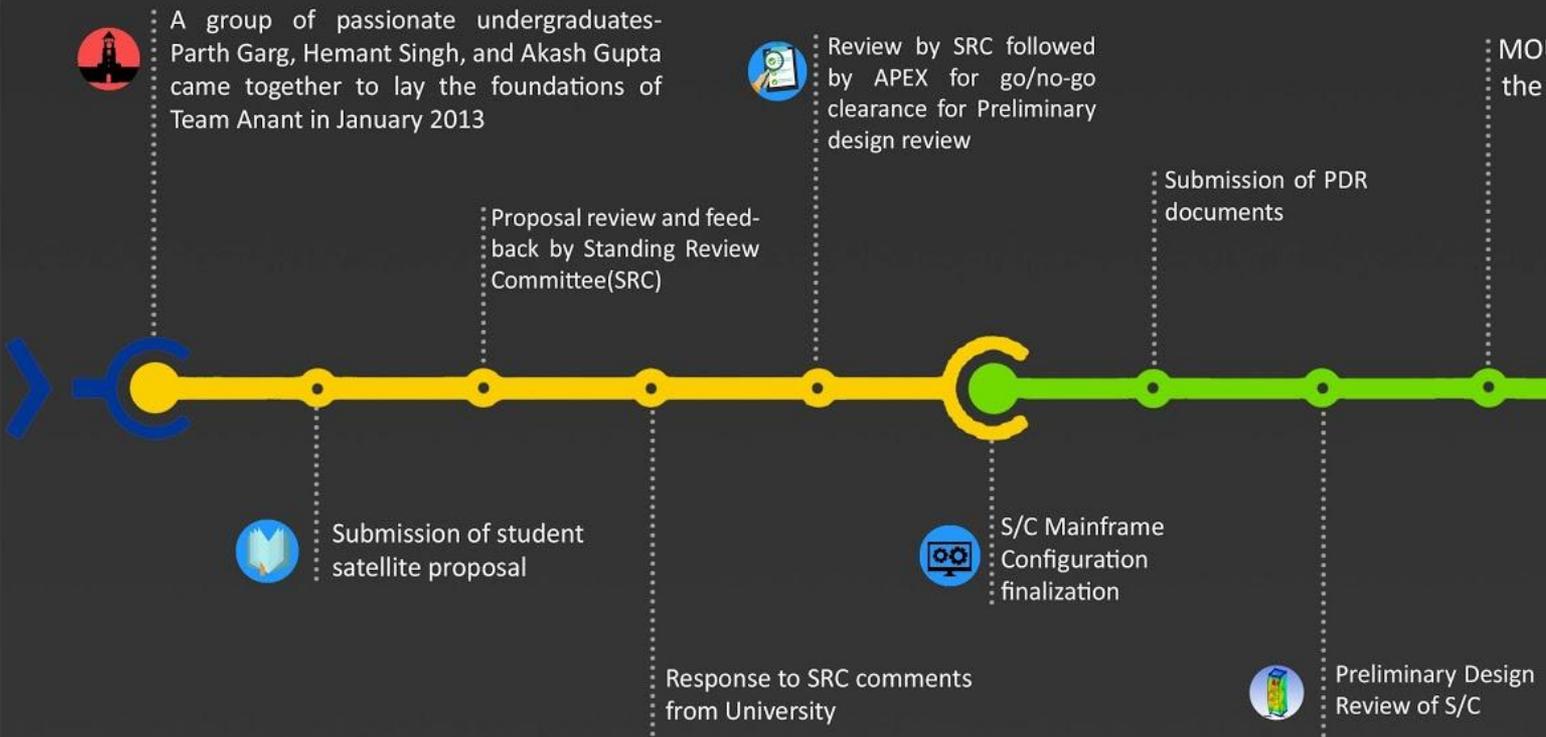
Source:
NASA



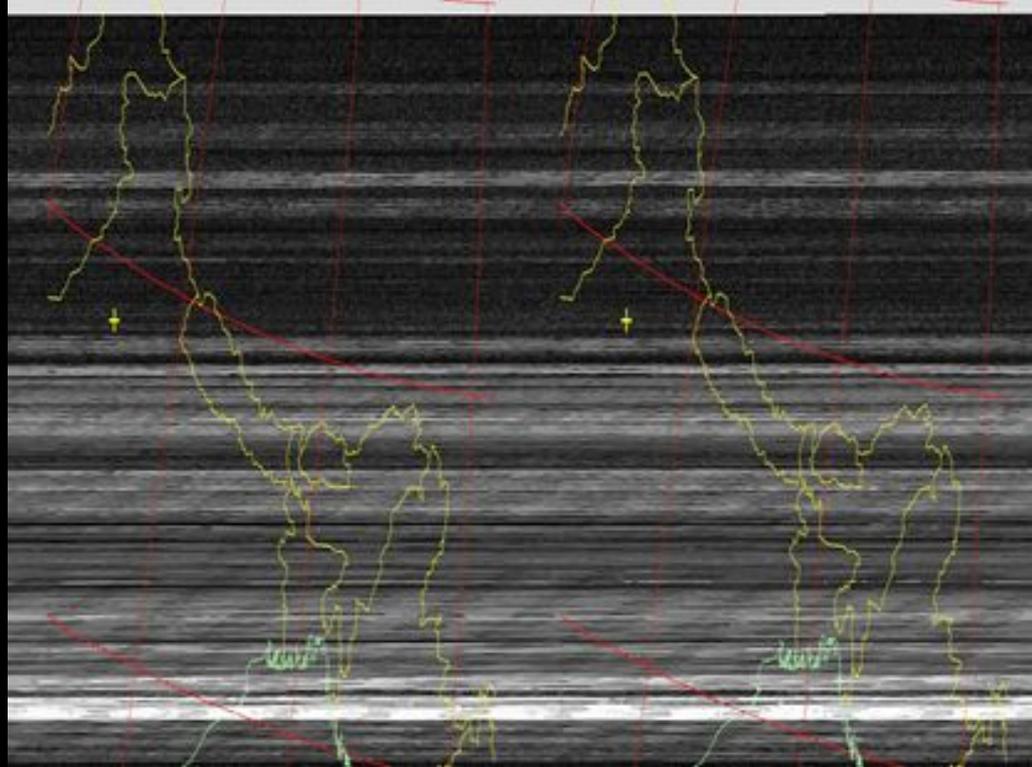
Timeline



TIMELINE AND OBJECTIVES



First ground station





Anant and Open Source

Anant and Open Source

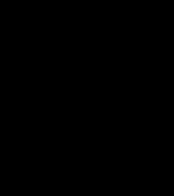


Research, not just follow known procedures

Correlate with academics

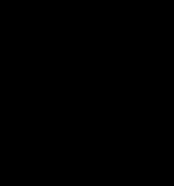


- Microprocessors
- Computer architecture
- Microelectronics!





How to correlate?



On Board Computer

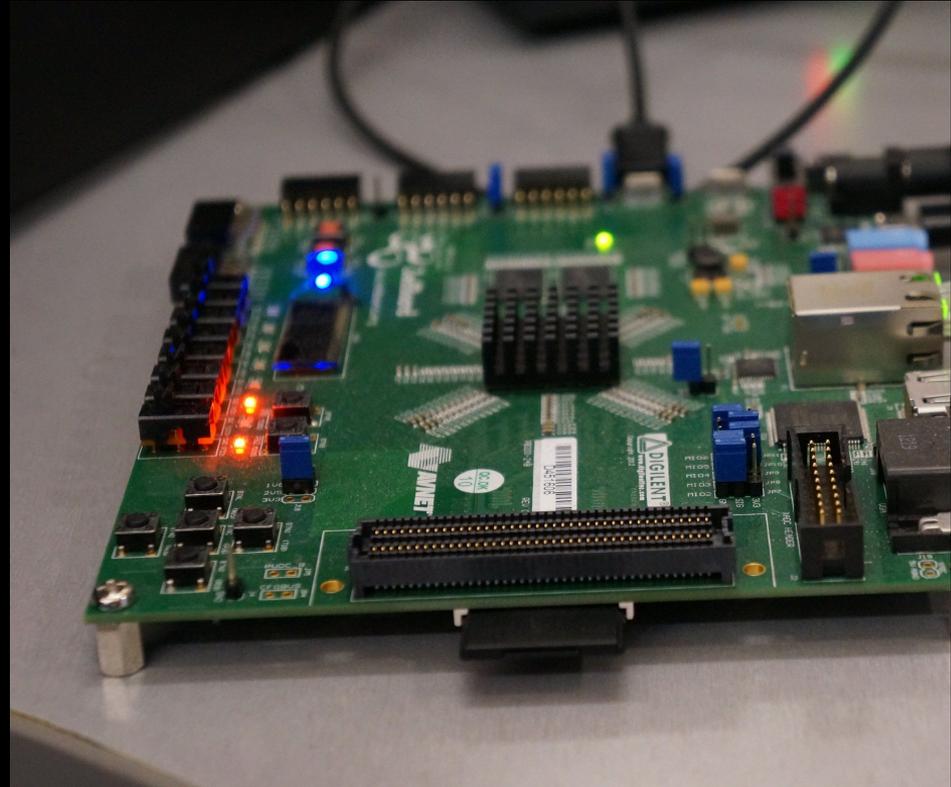
ZedBoard - Zynq 7000-SoC

- ARM Cortex A9 + FPGA

Runs PetaLinux

Also runs ADCS algos

Image compression on FPGA



On Board Computer

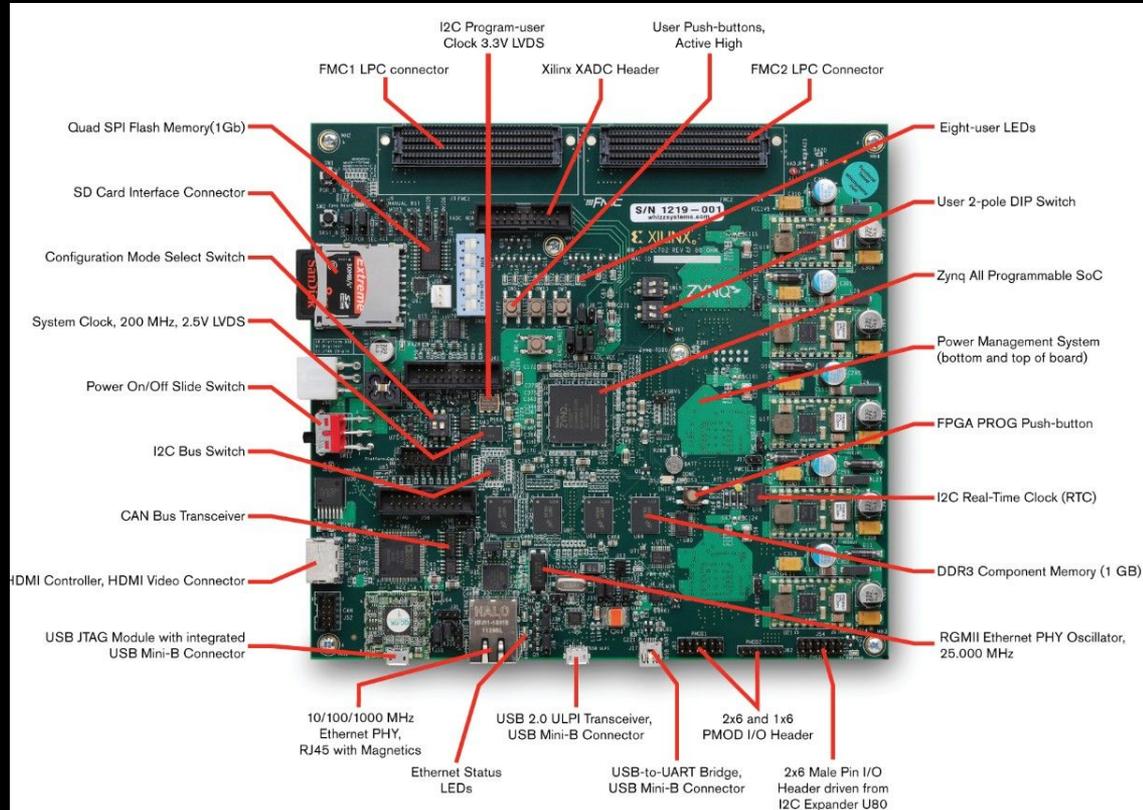
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On Board Computer

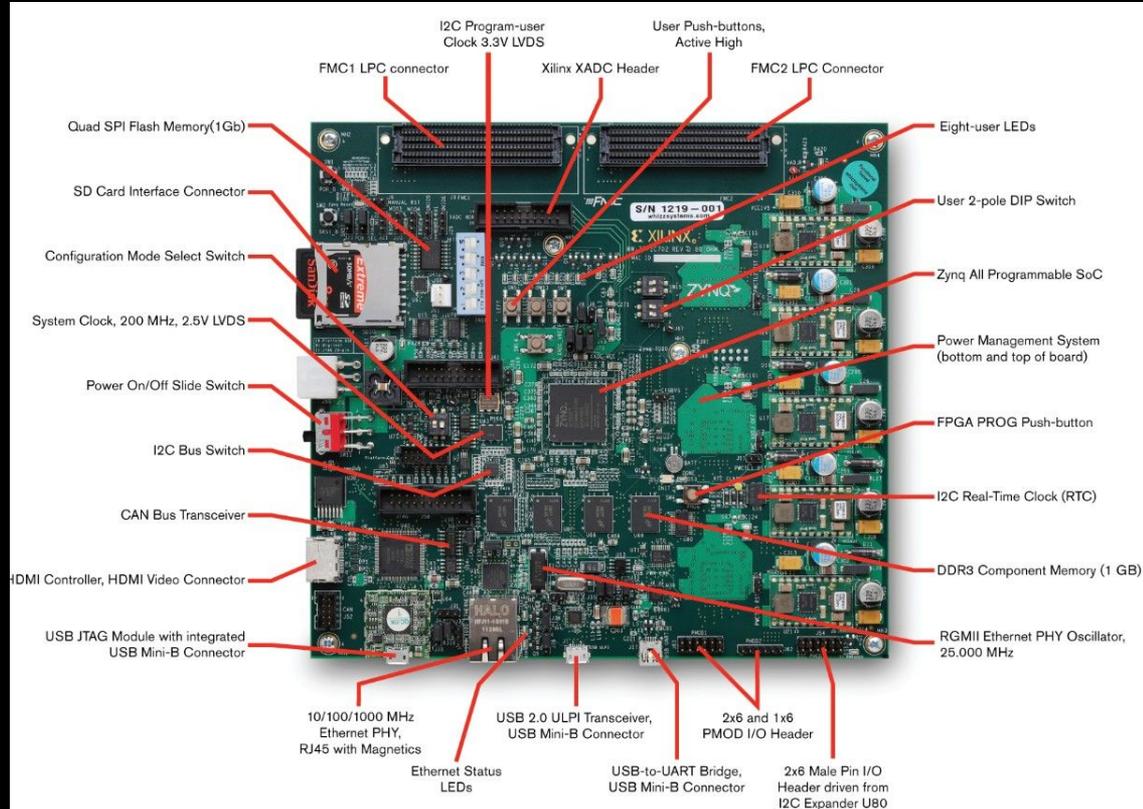
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On Board Computer

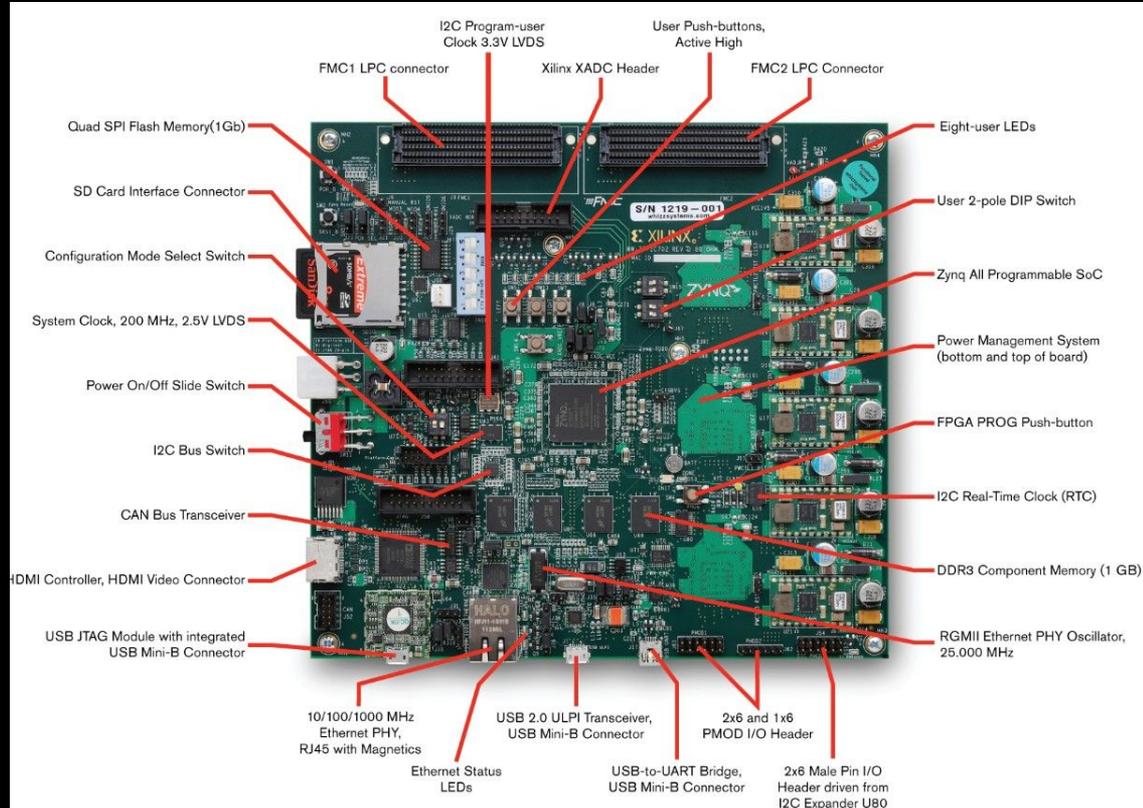
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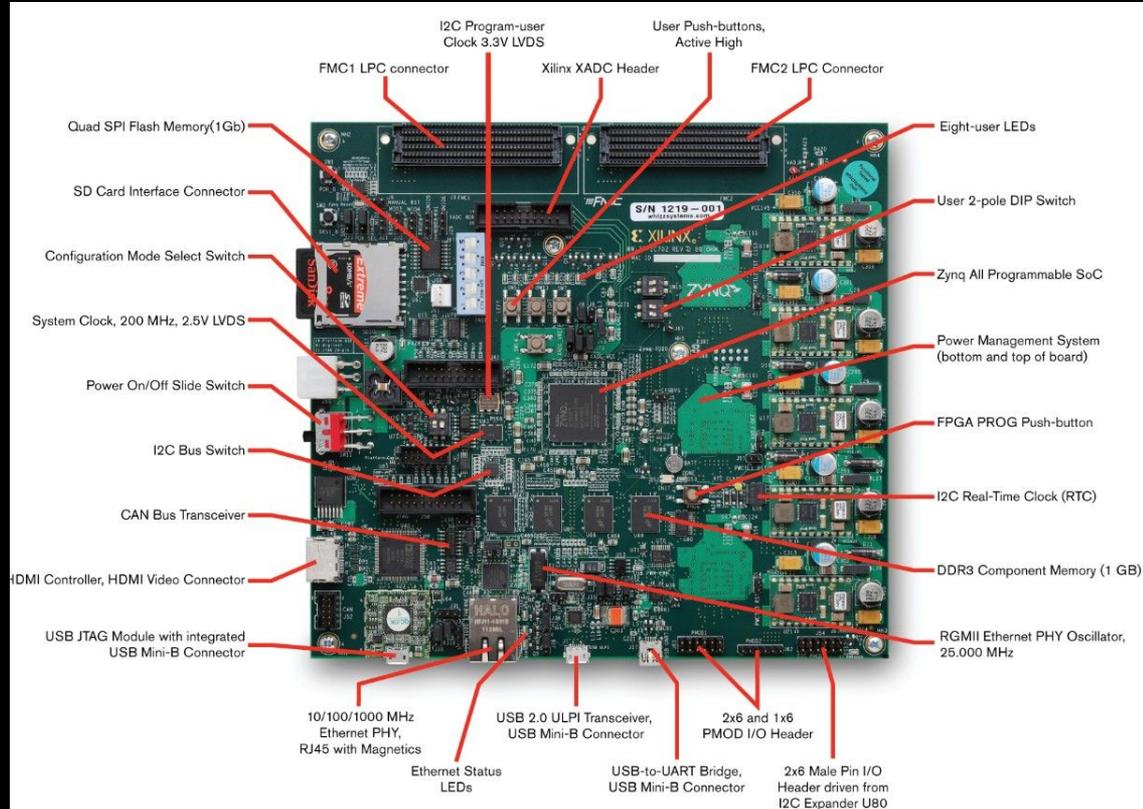


Image compression



Image compression



Lossless multispectral and hyperspectral image
compression

Operating System



Linux - the best way to understand a computer

Specific: PetaLinux

Understand computers at low level: Embedded systems

Understand computers at hardware level: Computer Architecture

Low level systems programming

Operating System



- Device drivers for custom low level actions
- Interrupts

Both devices and PS-PL

- Filesystems
- Flight Plan

Operating System

- OBC boots at start up
- Start up sequence coded in Linux
- Multiple processes spawned



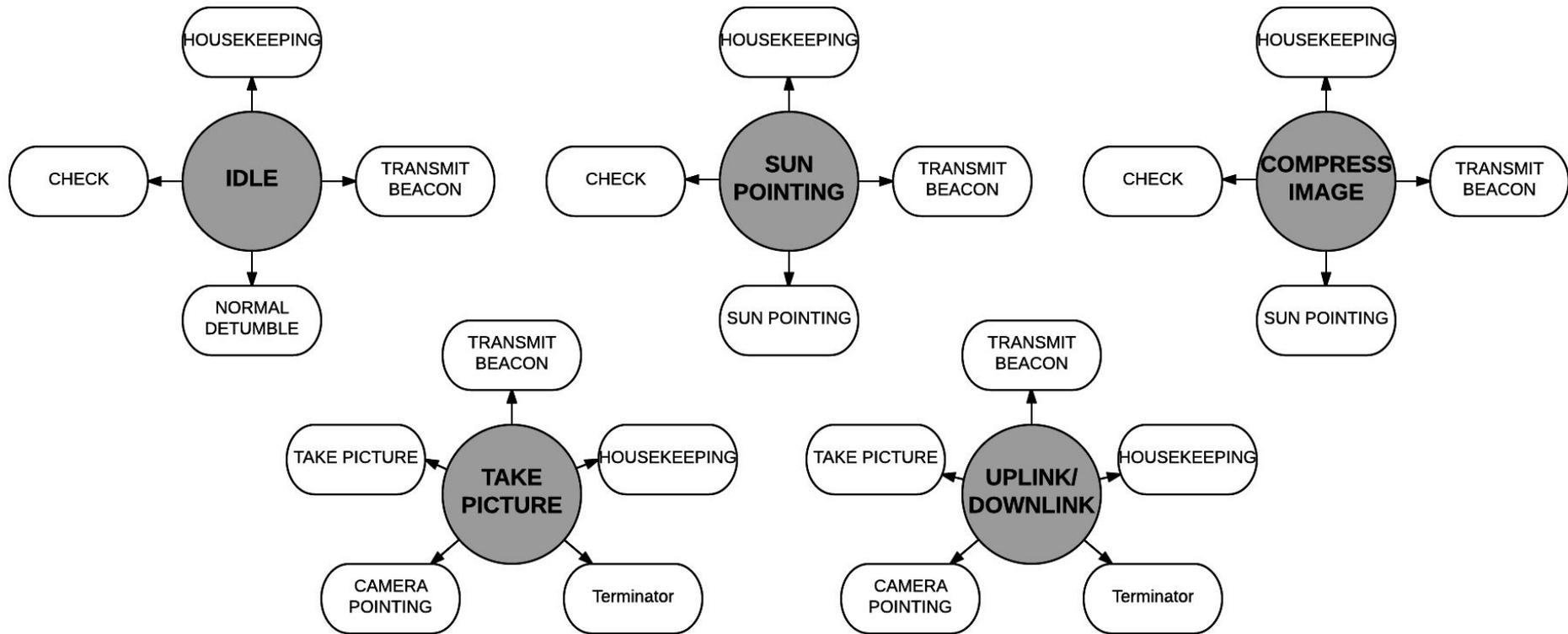


Figure 3 : Normal Modes and associated sub-tasks

Flightplan
Task execution.
Polling health metrics.
Process health management.



Mode specific tasks (modelled as Linux processes)

Housekeeping

Transmit

Take picture

B-Dot Control

I/O Interface Library

Operating System/Kernel space

Device drivers



And the rest of the satellite?





Shot on OnePlus
By Nemish Murawat



Shot on OnePlus
By Nemish Murawat

Arduino

Versatile testing hardware

Used for HILS

Interrupts testing

Device simulation





End.

tanuj.co

[@foowhiz](https://twitter.com/foowhiz) 